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AUTHOR Bilow, Scott
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ABSTRACT

The relationship between the costs of schooling and the size of school districts is discussed. The first section of this paper provides a critical survey of what economists have written about economies of scale and questions whether bigger is really cheaper or more efficient, as is generally found in commercial endeavors. The second section examines empirical studies by psychologists attempting to connect size with other factors (such as buildings, teaching staff, and organization, all of which are needed regardless of the school size) and trying to discover the optimal size for schools by using input (expenditures) and output (schooling) measures. The final section discusses perceptions on whether students learn better in larger or smaller schools and considers what effects school size has on: participation levels in extra-curricular activities, and the effect of participation on learning; achievement (which is not just a function of class size); attitudes (such as how students view their school and whether they will continue with higher education); and the lasting effects of school size on participation in adult life and social activity. Also included are a summary and suggestions on how states might put to use knowledge about economies of scale in schooling. (JMM)

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Department of Education
New York State College of Agriculture & Life Sciences at
Cornell University

The Size of School Districts: Economic and Psychological Perspectives

by
Scott Bilow

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Organizational Alternatives for Small-Rural Schools
In New York State*

Investigators:

David H. Monk
Emil J. Haller
Joe P. Bail

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INTRODUCTION

Many school administrators and others believe they can decrease the costs of providing public education by closing the least populous schools and sending the students to larger schools. There are of course many complex political, legal, and ethical issues concerning the reorganization of school districts and the closing of schools: issues of local control, equality of opportunity, school finance, job security. This paper will focus on one of these issues: the relationship between the costs of schooling and the size of school districts.

We will not discuss the costs of transition, the direct costs of consolidating or deconsolidating districts. These transition costs are liable to be quite high, and if we discover reasons to expect savings for districts of size X, the transition costs need to be included in the calculation to see if it is worth making the change. What we will be discussing are the differences in cost associated with different sizes of school districts. This means that we will be interested in how much money is spent and what it achieves, but we will not be interested in who spends it. If, for example, closing a school saves a district money because it changes their state aid formula, that does not count as a saving. Such a change does not make schooling less expensive, it merely shifts the burden of the expense.

This paper is in three sections. The first provides a critical survey of what economists have written about economies of scale. The second examines empirical studies by psychologists attempting to connect size with other factors. The final section provides a summary and suggests how States might put to use our knowledge about economies of scale in schooling.

THE ECONOMIC PERSPECTIVE

Why should we believe that bigger schools and school districts are cheaper? We all know of the waste and red tape associated with large organizations. Why should schools be any different?

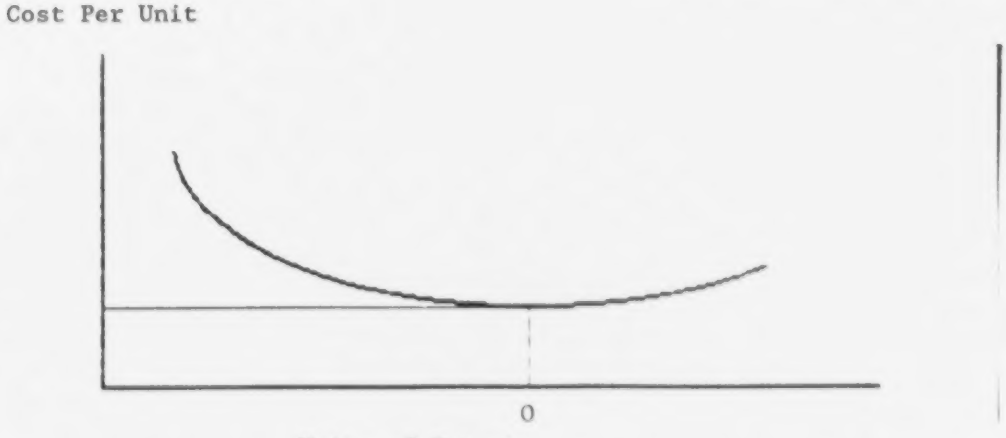
However, it is because people think that schools are not different that they think large schools are more cost efficient. "If it were not cheaper to run a big company," they ask, "why would companies be continually bent on expanding?" On this view, although bigger organizations cost more absolutely, they cost less relative to how much they produce. In the cant of economists, large-scale operations have what are referred to as "lower unit costs."

It is easy to think of car manufacturing. If building 100 cars costs $100,000 and building 200 cars costs $150,000 which is cheaper? Viewed simplistically, the 200 cars cost $50,000 more. But look at it this way: it costs $1000 each - i.e., $1000 per unit Q to build 100 cars, but only $750 each to build 200. Now change the units from car units to educational units, and suppose it costs $100,000 to educate 100 students, and $150,000 to educate 200. If we have two schools, each with 100 pupils, it will cost $50,000 more than it would to have all the students in one school. That is $50,000 "wasted."

Economists and managers of both large and small businesses have found that a large producer can usually produce whatever it produces at a lower cost per unit than a small producer can. We might say: "The bigger the company, the more efficient the operation," but this is only a half-truth; for it is also the case that producers can get to be too large, and that past a certain size unit costs will start to increase. Thus there are also diseconomies to scale.

In most (manufacturing) industries, the diseconomies to scale are initially smaller than the economies, but as the scale of production increases, gradually the diseconomies increase faster than the economies and eventually overtake them. This indicates that there is likely to be an optimal size of operations for any firm, let us call it "O". Businesses smaller than size O have available to them economies which it would be to their benefit to exploit; businesses larger than O could make more per unit profit if they decreased their size and lessened the diseconomies they faced.

For visual reinforcement of these ideas, look at the following graphical representation. Suppose this is a graph of the relationship between size of operations and unit cost of production of a certain producer. This producer faces what is called a "U-shaped cost curve": that is, there are economies of scale, but at some point they begin to run out. The lowest point on the curve (O) shows the lowest unit costs available to this producer. The optimal size O is the size at which the unit costs are at a minimum. If the firm wants to maximize its profit, it will try to stay as cloase as possible to size O (among



other things). Those who advocate school or district consolidations or centralizations must believe these two claims: (i) That schools face U-shaped cost curves, and (ii) That the particular schools under consideration are operating well below the optimal size. (It is interesting to note the paucity of advocates for de-centralization of very large school districts.) Thus to make an informed judgment about the value of combining schools or districts we would want to see empirical studies demonstrating the truth or falsity of these claims.

The empirical studies surveyed in this section aim to discover the optimal size for schools. The purpose of this section is to interpret and evaluate this literature, and to try to come to some conclusions about the validity of these two claims.

To measure economies of scale in schools, we must be able to identify the "costs" or "inputs" and the "benefits", "products", or "outputs". In the literature under review, these are often referred to as "variables". All of the studies covered in this section share the same basic methodology, measuring many different variables among relatively large samples of schools, and employing statistical analyses to find correlations among the variables. The difficult tasks of such studies are taking into account all the relevant factors, and measuring them accurately. Most of this section points out the different things that are likely to go wrong in attempting these two tasks.

There are also among these studies some important differences to bear in mind. One difference is in the breadth of analysis. Some studies attempt to measure overall scale economies, while some deal with only one or two types of costs, e.g., building maintenance. Studies of the latter type could ideally be combined to accomplish what studies of the former attempt on their own.

Another point to watch for is the sample selection. Many economies of size studies were conducted when there was much concern about the enormousness of some central city schools, and include in their data only city school districts. There is no reason to suppose that rural schools and urban schools are similar enough that everything true of one is true of the other.

A further difference is in the units that are studied. This survey is concerned primarily with studies of economies available to school districts rather than to individual schools. As Fox (1981) points out, studies of scale economies in individual schools vastly underestimate the actually high administrative costs of large schools, since these are in large part borne by the districts and school studies do not consider district expenditures.

Contrariwise, Guthrie (1979) avers that district size has little influence on instructional outcomes, since their functions are purely financial and political. Guthrie's facts are inaccurate; there is usually much more to what a district does than what he claims. Districts influence instructional outcomes whenever they direct and coordinate curricular decisions, purchase texts and other materials, or negotiate teacher contracts and hire teachers, principals, and other personnel. Hind (1977) also thinks school studies are better, because more expenditures are made by the school rather than the district. This may be true in Hind's Australia, but it is not true in the United States. Although most expenses occur in individual schools, that does not mean that it is the individual school that makes the purchase. Although most employees work in particular schools, they are paid and hired by the district. The district also has veto power (and more) over school expenditures, and the individual schools are financed by money that is raised district-wide.

Before looking at the studies we will examine those factors that have been taken to account for the existence of scale economies in industry; for insofar

as schools share these factors we have good reason to expect to find economies of scale in school operations. The fundamental factor contributing to scale economies is the indivisibility or "lumpiness" of the necessities of production or "inputs". School buildings provide a prime example. A school needs a gymnasium whether it has 20 students or 100. Suppose that twenty is a standard size for P.E. classes. The school with 100 students can have five periods of P.E. class, each with 20 students. The school with 20 students can have one period of P.E. class with 20 students. Both need the same gymnasium facilities, because neither ever has more than 20 kids using it at a time. (Possibly the larger school will need a bigger locker room if students are given permanent lockers.) If the two schools were to build gymnasiums, the smaller school would pay about five times as much per student. Gymnasiums are lumpy; they can't be purchased for just one hour a day, assuming there is no one to rent one from.

Further, in the smaller school, the gymnasium sits unused and essentially wasted for four hours of every school day. It still has to be heated and cleaned every day. Possibly with fewer students the cleaning will take less time, and such a small school would possibly need only a part-time janitor. Thus per-student cleaning costs may be constant. Some maintenance costs- e.g., floor polishing, locker repairs - will be higher in the larger school because of greater usage, but others - e.g., roof repairs and tuckpointing- will not. As a result, total maintenance costs in the larger school will not be five times higher, even if total usage is five times as much; so in this example, unit maintenance costs exhibit economies of scale. As do unit heating costs. The smaller school's unit heating costs will be five times as much: the gymnasium must be heated to the same temperature no matter how many people use it.

Here is a good place to point out some difficulties in making general statements about economies of size in schooling. Much of the costs just mentioned - roof repairs, tuckpointing, floor polishing, heating - vary not only with usage, but also with weather conditions and construction type. Buildings that do not experience harsh winters do not need roof repairs as often as those that do, nor are their heating bills going to be as high; but some might experience air conditioning bills that make up for these savings. Buildings in dry areas do not have kids dragging in slush and mud all the time. Stucco buildings don't need tuckpointing. Rural schools have less vandalism. Even though such costs account for a small portion of the school budget, such differences make generalizations problematic.

Now let us make a different comparison. A school needs a gymnasium whether it has 50 students or 500. Realistically, a gymnasium for a school of 500 is going to be larger than one for a school of fifty. But it need not be ten times as large; and even if it were ten times as large, it still would not cost ten times as much, for there are economies of scale in construction, too. Let us suppose the larger gym costs twice as much. Then the per student costs of the smaller gym will be five times as much as those of the larger gym.

What do these examples show? If you had just settled a new community and were planning on establishing a school system from scratch, it might turn out cheaper in the long run to build a large school rather than a few small

schools, depending, among other things, on the prevailing costs of construction, financing, energy, and labor, and on the weather, the size of the local population, and the population density. On the other hand, most states, schools, and districts considering centralization or consolidation have school buildings and staffing already in place. Even if there are economies of size in schooling - and, as we have seen from the gymnasium example, there are- these savings must be weighed against the costs of reorganization before we can conclude that it would be more efficient to consolidate established districts.

Buildings and machines are not the only indivisible school inputs. You cannot hire just half a teacher. You can hire a half-time teacher, but a half-time teacher teaches three medium- or large-size classes, not six small ones. Thus, having small numbers of students makes it difficult to offer a wide range of courses at an economical price. What is more, although it is often possible to hire part-time workers, it is hard to find skilled and reliable ones, especially in areas of low population density. This was more true fifteen years ago before there was a teacher surplus. Even so, hiring a part-time math teacher today may be next to impossible.

The indivisibility of personnel results in another factor that yields economies of scale, returns to specialization. To have expert teachers in many disparate fields, schools must either (i) maintain an extraordinarily low pupil-to-teacher ratio, which is very very expensive, (ii) find individuals who are experts in more than one field, which is very expensive in the rare cases in which it is possible, or (iii) maintain a large enough student body over which to spread the costs of employing many teachers. If we think of "subject-matter learning" as our desired outcomes, and if teachers who specialize create more learning per hour than teachers who do not, then the opportunity to increase the size of a school should mean an opportunity to increase unit output. We may question the accuracy of these "If..." clauses; nevertheless, the basic idea that increased size can lead to increased specialization which can increase production efficiency is generally reasonable.

On the diseconomy side, with increasing scale and specialization, coordination of operations and even basic communications becomes more and more difficult. Organizing and directing large numbers of people is extremely difficult. Duplication of tasks and groups working at cross-purposes are commonplace in many large firms. Also, with large size comes a bureaucratic hierarchy, which means there is always someone else to blame. This diffusion of responsibility can lead to carelessness, laziness, and even out-and-out corruption. This is not in the least to suggest that school employees are not conscientious; rather, the effects of various organizational structures on people's behavior cannot be overlooked.

Should we expect to see substantial economies of scale in school operations? The disanalogies between schools and capitalistic enterprises are significant. Although schools are attentive to the costs of their services, they are not profit-motivated. There is no competition between schools for customers - they have monopolies in their districts - and the state boards of education have in the past been notorious for repressing any data that would facilitate comparisons between schools,[1] so there is no pressure to maintain

efficiency more than what is necessary to keep taxes "reasonable." Further, there is no threat of the equivalent of "bankruptcy," i.e., of closing a school or of school officials losing their jobs because children do not learn.[2]

Most importantly, the outputs of schools are not quantifiable, nor do they translate into anything akin to profit. Some may like to count diplomas as outputs, and some may point to test scores, but this mistakes the incidental for the meaningful, the alleged signal of success for success itself. The crucial outputs of schools are adult persons and citizens, and human qualities, abilities, and knowledge; human relations are the stock in trade of schools. A school with poor interpersonal relations is simply a bad school. Further, diseconomies of size in industry seem to result from failings of personal relations. If we want to generalize from industry to schools, we have some reason to presume that the larger the school, the more difficulty it will have with interpersonal relations. That is to say, as schools get bigger, they would get less expensive, and they would get worse.

On the other hand, school administrators do acknowledge responsibilities to their clientele, and feel pressure from them to keep costs and taxes down. They also face the possibility of losing their jobs when public pressure makes it necessary. We should suppose that they would take advantage of economies wherever they can be found.

Measuring Outputs

The costs of things can be usefully compared only when the things themselves are comparable. A bicycle costs less than a car, but that does not say anything about which is the better buy. Applying this idea to schools, it would appear that when schools "produce" different outcomes, there may not be any point in saying that the outcomes produced by one school or school district cost more dollars per pupil than another, unless we have an independent scale along which to rate their various "products."

Schooling outcomes can differ in kind along many dimensions, including cognitive, affective, and psycho-motor. These differences can arise from variations in classes offered, materials and equipment available, teacher ability, school and classroom atmosphere, class size, and many other factors. Furthermore, outcomes can differ in degree along most of these dimensions. Any definitive conclusions about economies of scale in schooling will have to find ways to measure all of these outcome dimensions, and then either establish some common standard against which to compare all of them, or establish separate cost curves for each *sui generis* outcome. It would then be up to educational policy-makers to determine the optimal mix, constrained by people's willingness to pay.

Although some of the earliest studies by economists did not attempt to control for outcomes at all (e.g., Shapiro 1973), nearly all of the more recent studies do include some measure recognizing the importance of the variability of schools' effects. Some studies look for correlations between size and "quality." This is inadequate if the goal is to measure total costs, since as we have seen, quality can vary along many dimensions: level of physical or

history or art learning, level of test scores, level of personal development, level of equality and fairness, and on and on. The usual assumption is that the most important outcome is cognitive learning, or "achievement," and this is sometimes taken to stand for quality-over-all.

But we cannot directly observe cognitive learning. We cannot just look at a child and see whether that child has learned something. Thus proxy or surrogate measures are used. The most common is the norm-referenced achievement test, tests that are scored by comparisons to the millions of students who have taken the tests over a period of several years (Butler & Monk 1985; Cohn 1968; Dawson 1978; White & Tweeten 1973) There are several problems with the use of such tests as proxy for quality: (i) It is not clear that they really are proxies. The theoretical basis for connecting cognitive capacity with scores on tests is rather weak (see Orton, 1986). Although many tests do correlate with success in school or on the job, we characteristically cannot say why. This point is somewhat esoteric, though, and generally does not dissuade us from making decisions influencing the futures of individuals based on test scores.

(ii) Even if achievement tests do correlate with some cognitive outcomes, they do not measure all of these, and they do not measure other outcomes that may be at least as, if not far more, important, e.g., attitudes and values. (See the discussion of the acquistion of attitudes in a later section of this paper.) Dawson (1978) attempted to measure attitudes through interviews, but does not explain how he transformed the responses into analyzable data, or what he counted as positive or negative outcomes. Barker & Gump (1964) showed that self-esteem, responsibility, and other (presumably) positive outcomes are higher in smaller schools, but they did not measure the cost side.

(iii) Unless one controls for the abilities of students prior to their entering school, it cannot be said that the tests measure knowledge or abilities learned at school. Even if innate abilities are controlled for, useful comparisons can only be drawn between children with similar experiences and family backgrounds (e.g., parents' intelligence, attitudes, and income must be controlled for,) otherwise the differences are not necessarily attributable to the school itself. The point is that out-of-school learning may be the more significant factor. Fox (1981) suggests that even differences in pupil effort need to be considered, but this seems wrong to the extent that effort is a learned trait and can be attributed to the home and school experiences that need to be considered anyway. Cohn (1968) makes an attempt to control for native ability, but as he admits, the test scores he uses are of questionable worth. Shapiro (1973) controls for the level of education of the adults in the community; but since he does not distinguish parents from non-parents - but only takes the average over the whole district - the relevance of his data is questionable.

Another proxy that has been used for quality is input measures, such as pupil/teacher ratio (Riew 1966; Cohn 1968; White & Tweeten 1973), per-pupil expenditures (Riew 1966; Cohn 1968), teacher education (Riew 1966; Cohn 1968), teacher experience (Riew 1966), teacher salary (Riew 1966; Cohn 1968), and others. The assumption is that the quality of outcomes is a straightforward function of the quality of resources, as echoed in the popular expressions:

"At that price, it's got to be good," or "Garbage in, garbage out." Here there are even greater conceptual and practical problems than there were with measuring outputs themselves.

First, it ignores the interaction effects of different mixes and combinations of resources. Most resources only are efficacious in certain combinations: e.g., a reading text is useless without a reading teacher. But what the best combinations are, no one knows. How much time working with a teacher, and how much time on one's own? How much reading instruction and how much discussion of what was read? What is the optimum balance for reading, writing, comprehension, and vocabulary assignments? The question is: What is the most efficient use of resources to produce a desirable mix of schooling outcomes? In other words the question has to do with identifying the best educational technology available today. The answers to these questions are elusive. We do not know enough about teaching and learning, and we do not have a clear enough idea of how to weigh educational goals.

This raises severe problems for cost function studies. First, when producers (schools) do not use the best available technology, their production (of learning) is inefficient and thus does not display the true costs faced. Studies involving these schools - and all schools suffer from this to some extent, and so, therefore, do all of the studies - will continually overestimate real costs. Moreover, there is no consistency in the overestimation, because schools depart from the best available technology idiosyncratically; thus there is little basis for true comparison. Because of the interactions of resources and the uniqueness of technologies and techniques employed, we cannot separate the effects of any single input from the effects of the whole pattern of expenditures.

Second, the myriad of educational production function studies-statistical studies that aim to assess the effectiveness of inputs - that have been done regardless of these problems, starting with Coleman's EEO study of 1964 (Coleman 1966), have turned up little of practical significance. Several factors have been found to correlate with performance on achievement tests (Jencks, 35 al., 1972; Bowles & Gintis, 1976; Bridge, et al., 1979; Murnane, 1981), but for the most part this knowledge has been of little use for those who wish to improve the nation's schools. Some proven factors, like years of schooling and socioeconomic status (e.g., J. Coleman, et al., 1966), do not tell anything about how to induce or improve learning. We know that teacher quality makes a difference for learning, but measuring teacher quality has proved elusive; some gross distinctions have proven significant for - for instance, quality of college attended (Summers & Wolfe, 1977) - but gross distinctions can validate only gross generalization. The teacher's intelligence and enthusiasm might appear to make a difference, but these again can only be measured grossly.

Note the absence of the commonly accepted proxies for quality; per-pupil expenditures, teacher salary, teacher experience, teacher training and certification, class size. If none of these factors can be taken as a sign of a successful school, then there certainly can be no purpose in comparing schools along these lines if we want to assess school quality. Significantly, it is

these variables that have been employed in the economies of scale studies as proxies for quality (see Section III below).

Measuring Inputs

Most studies use current expenditures as the measure of inputs. These studies thus ignore other fiscal costs - e.g., depreciation - and all non-fiscal costs, many of which have already been discussed. Each of the categories of inputs will be discussed in turn.

1. Capital Expenditures. This factor is generally ignored in the studies, apparently because no one knows how to interpret the available data. Capital costs arise unsystematically, and would appear to be more a function of history and the vagaries of weather and the Federal Government than of school size or anything else. Further, it is difficult to assess the value of a property (school) that has no imaginable resale market. Cohn (1968) takes into account the worth, per pupil, of the school buildings and grounds; but as Fox points out, although this may say something about population density, it says little about anything else. White & Tweeten (1973) measure "Buildings", separately from "Operations and Maintenance" (O&M), but they give no further indication as to what this might be.

2. Transportation. Strictly speaking, transportation is not a school input. But it accounts for a sizeable portion of the rural school's expenditures, and thus affects their ability to offer quality programs and keep taxes to a minimum. And in most areas, school district reorganization and increased school size cannot be achieved without expanding transportation services.

Transportation costs have often been overlooked or inadequately treated (Riew 1966; Cohn 1968; Dawson 1978; Coleman & LaRocque 1971; Osburn 1970). For example, Shapiro (1973) uses a dummy variable for "rural" or "not rural" to substitute for density, but this is inadequate since population density varies greatly, especially in rural areas. Osburn (1970) studied current per pupil expenditures in a selected area. In the schools studied, the average cost curve was not U-shaped but rather constantly descending, which means there was no point at which diseconomies of size began to outweigh economies. However, this does not indicate that there would be any savings available from consolidation, because transportation costs would have to be added. Population density in large part determines the optimum size of schools and districts.

Population density is not the only crucial factor in transportation costs. White & Tweeten (1973) also considered driver's salaries (which vary with prevailing wage rates), vehicle maintenance (which varies with age of vehicles and roads, with weather, and with labor costs), depreciation, interest on investment, insurance, fuel, purchase costs, seating capacity, and the scatter of children relative to the location of the school. Additionally, the time spent (wasted) by students traveling to school is a cost, and a large one when students ride for as much as seventy-five minutes each way. Related and possibly inseparable costs of massive transportation systems would include (at least) the loss of the school as a community center with increasing distance,

and decreased learning if students are adversely affected by long trips and come to school surly, distracted, or depressed. (In the normal case, where trips are not more than 30-45 minutes or so, students do not seem to be greatly affected.

A major problem faced by smaller schools is that because of demographic instability they are unlikely to have always on hand the most-appropriately-sized buses for the most efficient routing plans. It is expensive and wasteful to run empty buses, and only less wasteful to run half-empty ones. We suppose that the closer the vehicle is to full-capacity, the lower is the cost per passenger per mile. The number of seats needed on each route and the number of routes - hence the number of buses and drivers- is liable to change drastically, percentagewise, from semester to semester. The fewer buses and bus routes a district has, the more difficult it is to adjust. The smaller schools are also the least likely to have access to the computing power necessary to plan the most cost-efficient routes.

White & Tweeten (1973) used computer-simulated routes and estimated transportation and total costs for districts of varying size and density. Theirs is one of the most complete studies yet done. Yet its applicability is at best questionable. They assumed an even population dispersion, centrally located schools, and set a maximum travel time for any individual of one hour each way. Thus they do not consider the just mentioned problems uniquely facing the smallest schools.

Holland and Baritelle (1975) calculated the "ideal" size and location of schools for an actual area, which included nine real districts and 2,100 square miles in Washington. Cost data for transportation and instructional expenses was obtained, and a computer calculated optimal bus routes and tried to minimize costs. They ran three sets of comparisons: long term, short term, and immediate. For the long term calculations, they allowed school population and plant size to vary and included capital costs. For the short term calculations, plant size was held constant, and for the very short term the only factor allowed to vary was school population.

They measured the savings available by summing the total expenses of all the districts, before and after. The total savings available immediately were less than .1% of the actual expenses: the savings from school closings were equalled by the expense of busing. The total savings available for the short run, where school construction was allowed, were about 1%. And over the long run, the maximum savings available were 1.3% of current expenditures. (When the price of gasoline was allowed to double over the long-term period, closing schools was far more expensive than the current system.) This is the savings when no value is placed on students' commuting time.

This study has some weaknesses. First, their only control for quality was to ask the actual local superintendants whether the quality of other schools in the area was comparable. Second, they assumed that current operating costs per pupil would remain constant. Thus they did not allow for possible savings from higher pupil/teacher ratios and possible costs of running quite empty buses. Finally, they did not take account of the costs of implementing changes,

including the costs of figuring out who to move where, the costs of moving offices and belongings, and the costs to staff of longer rides to work.

3. Instruction. Instructional costs include teacher salaries and other benefits, purchase and rental of instructional materials and equipment, and other expenses directly involved in teaching. Teacher salaries are normally the largest single component of a district's budget, and the variable most influential on teacher expenditures is the pupil-teacher ratio. Larger schools and districts appear to achieve gross savings by increasing their pupil-teacher ratios (Sher & Tompkins 1977). This move is generally supposed to have costs in terms of decreased learning opportunities (see Glass 1982). However, the evidence that class size makes a difference within the normal range of class size - approximately 18-30 - is exceedingly weak, see, for example, Bridge et al. 1979 or ERS 1971. Summers & Wolfe 1977 have supportive and interesting results, and none of what Glass (1982) says does anything to refute this point. Other factors that affect teacher salaries are union activity, local wage rates and cost of living, and attractiveness of the area and the school.

Hind (1977) argues one saving from consolidation, a corollary of the "law of large numbers." Assume all classes are to have a uniform number of pupils. Divide each school's population by that number and you have the number of full classrooms and teachers, and there will be a remainder, some students left over. Let us say that the teacher who must be hired for these remaining students embodies some excess teaching capacity, because he or she has less than a full class to take care of. The average excess teaching capacity among all schools will be one-half teacher. For every school eliminated by consolidation, the equivalent of one-half teacher, which would otherwise be wasted, is also eliminated. The savings are the direct result of consolidation.

The point is well-taken, but its practical importance varies considerably with individual circumstances. The problem is that there is often insufficient uniformity of class size, which is assumed by Hind's argument. This is because students are grouped by age and ability. As an example, consider a K-6 school with 200 students evenly distributed by age/grade, so that there are 28 or 29 pupils per grade, and suppose the class size is legislated at 25. The excess teaching capacity is not simply found by dividing the total number of students (200) by the desired class size (25): that yields exactly eight classes. But if pupils are to be separated by age/grade, what we really get is seven classes - one per grade - plus three or four students left over per grade. Here, consolidation with a second school that had 21 or 22 pupils per grade would be ideal: together the two schools could justify exactly two teachers per grade. How likely is it that the nearest school has just this population?

Of course, this is what happens in districts with more than one school: they merely transfer those three extra students. In that case, however, the schools are not closed. Indeed, Hind's point does not bear on <u>school</u> closing or consolidation policy directly, but only on <u>class</u> closing policy. Thus an obvious response to the problem of "wasted" teaching capacity is that rather than consolidating, an equal or better suggestion might be just to increase the class size. Seen from one perspective, this would in our example have the effect only of transferring the wasted teacing capacity from the first school

to the second. But the question that is important to answer before doing any of these calculations is: What size ought classes to be? Until we know or decide this, we do not know how to tell whether or not there is excess teaching capacity, hence we do not know whether or how much we could save.

What happens in some very small schools, is that class size is raised by combining grade levels; e.g., second and third graders will be in one classroom with one teacher. Common opinion avers that such classes do not provide an adequate education. Indeed, eliminating such practices was one of the central aims of the earliest school and school district consolidation movements. Evidence supporting or rebutting this opinion is hard to come by. The practice has obvious drawbacks in high schools and junior high schools because it restricts the degree to which teachers can specialize. But in the earlier years when children learn only reading, social skills, and general knowledge, the disadvantages are less clear. Presumably, it will tend to widen the range of maturity and abilities in each class, which can make teaching more difficult.

White & Tweeten's (1973) findings are relevant to determining economies of scale in instructional costs. Controlling for three types of curricula- "desirable," "adequate," and "minimal" - they found minimum average costs, as measured by total per pupil expenditures, to occur at district sizes of 900, 750, and 550, respectively. But note that districts of this size very often operate only one school building. These figures assume a uniform student population density of 1.8 students-to-be-bused per square mile.

They also computed economies allowing for variation in population density: minimum average costs vary from a school size of 300 when the density equals 0.6 students-to-be-bused per square mile, to 1075 when the density equals 3.0, but this assumes the "acceptable" curriculum across-the-board. Regrettably they do not simultaneously vary curriculum and density, and hence we do not know for certain how large the combinatory effects of either are.

But in sum, they found that other things being equal, sparsity of population can have an adverse effect on a district's ability to provide high quality programs. However, this conclusion does not demonstrate any merit of consolidation. They, as well as Holland & Baritelle (1975), showed that transportation is expensive. We should not blindly believe that more transportation can ease the problem, and in many areas increasing transportation is a necessary step in increasing school size.

4. Operations and Maintenance. O&M makes up a small but unavoidable part of school budgets. One would expect that the bigger the building, the higher the upkeep expense, but that additional expense supports the schooling of many more people. We want to know which factor predominates. Hind (1977) found great economies of scale for "maintenance" expenditures in elementary schools of less than sixty or so students. In bigger schools economies were still apparent, although greatly diminished. That is to say, the per pupil maintenance expenses differ more between schools of 30 and 35 pupils than between schools of 130 and 135. The study controlled for the average age of buildings, and used a ten-year average for student population to control for year-to-year fluctuations. As Hind admitted, he did not control for type of

building construction, weather, or "other site factors," and since the study is of Australian schools, generalization to schools in this country, where the weather is different and the common building types may or may not be, is questionable.

5. Supplies. An alleged advantage of large districts is the ability to buy supplies, instructional materials, and other goods in large quantities, and so recieve better prices. However, Zymelman (1973) argued that the cost of distributing supplies within the district - or among districts when districts combine their purchasing powers - counteracts any savings from centralized purchasing. This has some truth too. Sometimes it is advantageous to combine purchasing and sometimes not (see Zymelman 1973). No study has yet determined under what circumstances larger purchasing yields savings.

6. Administration. In 1955, Terrien and Mills argued that the administrative component becomes a greater portion of the school organization as the size of the school system increases. Fifteen years later, Holdaway and Blowers (1971) argued the opposite, that the proportional size of the administrative component is negatively related to the size of the school system. They found that the proportion of "central office professional personnel" increased with increasing size, but that "central office administrative personnel" and the two (professional and administrative) combined did the reverse. These findings held true whether size was measured by number of pupils, teachers, or total staff. But interestingly, the administrative ratio shows no relation to the number of schools in a district. In any case, one might presume that administrators may serve necessary functions in enabling districts to take advantage of size economies and furthering returns to specialization; if it could be shown that the savings and the quality gains outweighed the administrative salaries, a larger administration would appear to be desirable. This has yet to be shown.

Other Considerations

1. Economy vs. Efficiency. We have already (in the discussion of problems arising from using inputs as surrogates for outputs, pp. 9-10) seen how most studies have unjustifiably attributed differences in average costs between smaller and larger school districts purely to size. Butler & Monk (1985) focused on separating the effects of size from differences in efficiency. Their theory seems to be that there is a "small school style" of administration and a "big school style." The small school style is more efficient at least within its present range of employ. Which style a school operates by depends not only on size, but on something else (they do not tell us what.) District consolidation may be unnecessary if the cost-effectiveness of schools can be improved by making schools operate in the small school style.

2. Another Type of Study. Thomas (1972) discusses the "Economist's Model" of school operations. On this model, the inputs to schooling are simply the total costs of operating schools, viz. money and time; and the outputs are the additional earnings that accrue to students from their schooling. Thus, schooling is viewed as a capital investment in human beings (see Schultz 1971). If what one earns reflects what one has learned, then the better the school,

the more its graduates should earn through their lives. There are further benefits to schooling than just increased earnings, such as freeing parents' time for work, decreasing crime, protecting public health, and others (Schultz 1971). Again, these goods are hard to measure and to put a dollar value on, and so it is hard to compare how successfully different schools promote them. But it does anyway seem possible and desirable to know how small and large schools compare in increasing the lifetime earnings of their students. This is something that has not been studied.

PSYCHOLOGY

This section discusses some widely- and not-so-widely-held perceptions about the strengths and weaknesses of small schools. In this section we ignore questions of efficiency and ask simply: "Do students learn better or worse in smaller or larger schools? If they do, what kinds of things do they learn better and what kinds of things do they learn worse?"

Researchers have different ways of sorting schools by size. Some use senior class size, some school size, and some do not even say what they mean by "large" or "small." Some do not distinguish between three- and four-year high schools, some use only four-year, some do not say. For convenience, assume that all high schools are four-year; if the study reports senior class size, the enrollment will be multiplied by four. This leads to some inaccuracy, inasmuch as a three-year school has 25% less students than a four-year high school with the same number of seniors. But it is necessary because most researchers do not indicate whether the schools under study are three- or four-year schools.

Besides the main question - Do students learn better or worse in smaller schools? - there is an important additional question to keep in mind, namely: Why are smaller schools better or worse at certain functions? It might be possible to make smaller schools work like larger schools - or vice-versa- without actually making them larger; and such a scheme may enable us to capture the advantages of both bigness and smallness. This section provides a survey of studies that have investigated correlations between size of school and learning outcomes. If any are discovered, it will be up to educational psychologists and learning theorists to discover their genesis.

Participation

If nothing else can be said conclusively about the differences between small and large schools, one thing certain is that students in smaller schools have more opportunities to participate in extra-curricular activities, are more likely to participate in a wider variety of activities, and are more likely to participate in leadership roles.

It would be perfectly natural to think that there are more opportunities for students in smaller schools. For example, all schools have only one Student Council President, and it is easier to be elected when competing with

100 others than when competing with 500. When there are only twenty people trying out for the football squad, no one is going to get cut.

On the other hand, one might expect smaller schools to have fewer activities available for students. For example, one would not expect to find a German Club in a school where German is not taught; but if smaller schools are less able to offer a second foreign language, they are less likely to have more than one foreign culture club. It is harder for special interest activities to reach a critical mass when there are fewer people to draw upon.

Offhand, it may seem that the answer turns on the rate at which the number of activities varies with the number of students. But merely offering more opportunities does not increase participation. We all know of groups that were cancelled because not enough people showed up, and of groups that were spontaneously created when interest was shown. The studies under investigation all measure actual participation, not theoretical opportunities.

The first studies of participation rates were reported in Barker and Gump's Big School, Small School (1964), and the studies since then have all relied on Barker's concept of "behavior settings."[3] A behavior setting is an organized system of people, place, and things, where there are shared purposes and expectations and a variety of opportunities. A school is a behavior setting, but so is an individual class, and so is an individual class activity or project.

According to the theory, the "vector forces" of behavior settings - i.e., the obligations and responsibilities, or the work that needs to be done - are virtually constant, regardless of the number of participants. Therefore, the fewer participants there are, the greater is the strength and the range of the forces that impinge upon them. They suppose that there is a minimum number of participants for any behavior setting: as the number of participants increases, the pressures on each decrease.

These pressures work in two important ways in small schools. First, since there are fewer students in small schools, more vector forces impinge on them, and more strongly. Students feel obligations to join and support organizations in which they might otherwise have little interest. Second, since there are fewer participants in any organization, and since each organization is more important to the life of the school, students who do participate are more important to the success of the endeavor and the school, and have more responsibility. Both of these pressures contribute to increase participation levels.

Barker & Gump tested much of this theory and their results are highly supportive. Large schools were found to offer a wider variety of activities, but small schools offered all the same kinds of activities. This makes it seem that students in small schools are not losing anything, but that is misleading. Behavioral settings were classified "according to a common-sense idea of the reason for the existence of the settings." (Barker & Gump, 1964, p. 80). But the reason for the existence of any behavioral setting is not determinate of the activities of the setting. If we are interested in participation, we ought to be concerned with what students actually do. But Barker and Gump's idea of

"same kind of activity" does not focus on what participants do. Thus the conclusion that small schools offer the same kinds of activities as large schools is trivial.

But that does not mean that the difference in variety is significant. Students in large schools may have more choices, but students in small schools, for some reason, take better advantage of the opportunities they have; they participate in a wider variety of activities, and they participate in more activities. (Barker & Gump, 1964, pp. 92-93).

Small school students also participate more actively and play more central roles in their settings. This is just what the behavior settings theory predicts. But Barker and Gump also found that students who are more active and have pivotal roles tend more to derive their satisfaction and enjoyment from displaying competence and meeting challenges. (Barker & Gump, 1964, pp. 113-114.) The less central participants tend more to get their satisfaction from being part of a group and from witnessing events.

These results may also appear trivial. A critic may say: "People who participate get their satisfaction from participation, people who observe get their satisfaction from observing. Why is that surprising or significant?" It is significant if a child's activities and experiences help determine what kind of person that child will develop into. If children learn to desire the satisfaction of active participation rather than the satisfactions of passive observation, then they will likely be more active - and perhaps more successful and happy - adults. Schoggen suggests that participation develops interest and enjoyment, and that variations in participation rates may help account for high dropout rates in large schools (Schoggen, 1984).

Other studies support Barker and Gump's findings. Grabe (1976) achieved similar results. Wicker (1968) showed that students in small schools are more likely to participate in a wider variety of extra-curricular activities than students in large schools.

In Kleinert's study (1969), students in small schools (less than 600 students) were more than twice as likely to participate in one or more extra-curricular activities as students in large schools (more than 1,500 students), and those in medium-sized schools fell inbetween. No small school had less than 100 "participation units" (p.u.'s) per hundred students, where one student participating in one activity counts as one "participation unit." 75% of the small schools had more than 150 p.u.'s per hundred students, while only 5% of the medium-sized schools did. Nearly two-thirds of small schools had more than 20 "leadership units" per hundred students (and nearly one-third had more than 30), but no medium or large schools did. No small school had less than 10 leadership units per hundred students, but about half of the medium and 86% of the large schools did. In sum, a higher percentage of small school students are active, and they are more active. Schoggen's results are supportive. More than half of the students in schools of more than 1200 participate in no extra-curricular activities.

However, it is important to realize that these researchers have only counted participation in school-sponsored extra-curricular activities. It is

reasonable to suppose that in the smaller districts, a large proportion of the activities available to students are sponsored by the school, while in larger districts and in more urban settings, other community groups play a substantial role. Thus these studies may to some extent exagerrate differences in participation rates.

Lindsay (1982) called high schools with less than 400 students "small" and those with more than 1600 students "large." The small schools had higher participation rates in each category measured, including athletics, drama/music/debate, journalism, and student government. The medium schools fell inbetween. He controlled for ability (Using the Research Triangle Institute test for reading, vocabulary, math, and reasoning), socio-economic status (SES), and ruralness.

Wicker (1968) showed that students in small schools (i) participate in more different kinds of activities, and (ii) hold more positions of responsibility. These results are predicted by the Behavior Settings Theory, which supposes that there will be pressures to participate in any activity that is not adequately staffed. Baird (1969) found that small school students average more recognition and accomplishments in writing, leadership, drama, and music. And a higher percentage of large school students have no such accomplishments. Accomplishments were such things as publishing a story in a school or a local paper, being elected class officer, winning an award, etc. He used four size categories; small schools were those with less than 25 students, and the large schools were those with more than 400. He also controlled for ruralness.

Participation and Learning

But there is little if any value in participation in extra-curricular activities per se. If students do not gain anything valuable from their participation, then there would not appear to be any reason to encourage it. But common sense tells us that much can be learned through participation in activities, especially when one has an active or leadership role. At the very least, participation gives students an opportunity to learn about the activities in which they participate, to see whether they enjoy them and whether they have a knack for them, and to develop certain skills.

Researchers have not tried to document or measure these effects. But they have been interested in other, less intuitively obvious outcomes from participation.

Mergendoller (1982) surveyed the academic psychologists' literature and concluded that participation in extra-curricular activities can enhance growth in at least four dimensions of development: (a) Cognitive, (b) Identity, (c) Relatedness (Friendships) and (d) Autonomy (Self-expression). He suggested reasons for each, but they are untested surmise, based not on any research but on (educated) common sense:

(a) The assumption of multiple roles, which is required by participation in a variety of activities, can encourage the development of multiple

perspectives on society. The attempt at reconciliation of the perspectives (if the youngster attempts it) can lead a better understanding of one's society, and leads to and even constitutes moral thought.

(b) Participation in a variety of activities can lead to exploration and development of new competencies.

(c) Participation in a variety of activities can lead to interaction with a diversity of individuals and new and varied friendships: although this may be less true in smaller schools where there is less diversity available.[4]

(d) Extra-curricular activities may be less directed toward achievement, and so can allow for more student control. He cannot mean that the participants are not concerned with achieving anything. He must mean rather that such groups or clubs most often do not have as a central purpose the achievement of any end in which the school has a vested interest.

Wicker (1968) found that students in small schools have (i) more concepts to describe extra-curricular activities, and (ii) more satisfaction from challenges. These outcomes he attributed to the benefits of increased participation and leadership experience.

Nelson (1973) showed that participation levels correlate with the aspiration to attend college. This does not tell us whether students who participate thereby develop aspirations for college, or whether (what seems more likely) students with aspirations for college are more likely to participate, or whether both are the case, or whether the correlation is attributable to some third thing. For example, intelligence may be a cause of both college aspirations and participation.

Willems (1967) found that students in smaller schools tend to have a greater sense of obligation to their extra-curricular activities. The thinking goes like this: Wicker (1968), Kleinert (1969), Barker & Gump (1964), and others have found that (i) the larger the school, the higher the proportion of students with only marginal roles in their activities. Willems (1967) achieved the same results. Willems also found that (ii) the more marginal is one's participation, the less sense of obligation they have. This might be taken as a corrollary of the Behavior Settings theory. Willems tested it through questionnaires and follow-up interviews. Therefore, Willems concluded that (iii) the larger the school, the less sense of obligation. Whether this sense of obligation to one's clubs and other extra- curricular activities is a desirable outcome is another question.

Achievement

Is there any relationship between school size and academic achievement? Since the smallest schools often have smaller classes, one must be careful about spurious correlations in studies that do not control for class size. There is no basis for an indubitable conclusion about the relationship between class size and academic achievement, but the evidence seems to better support smaller classes, other things being equal (see Glass et al. 1982). But when

comparisons are made between class sizes within the predominant range-about 18 to 30 or 35 the difference class size makes is minimal. Glass, et al., (1982) attempted to combine the results of many studies on the effects of class size. But if we were to throw out the data from studies without adequate (or even minimal) controls, from studies that make useless comparisons (e.g., comparisons between a class of one and a class of two students, or between a class of three and a class of 24), and from studies that use biased or invalid tests for measuring achievement, the efficacy of small classes will be further lessened.

Even if students tend to learn better in small classes, and if small schools tend to have smaller classes, this would not imply that schools should be small; it would only mean that classes should be small, and this could be achieved by making classes in large schools smaller. Thus, even if small classes are an advantage, then class size is still not a relevant issue for the comparison of small and large schools. On the other hand, it may be that we should be less troubled if many schools remain small. For more on the relationship between school size and class size, see Monk, 1986.

A study by the New York State Education Department (1976) found that the negative relationship between enrollment and achievement is reduced to insignificance when population of district is included in the analysis. The conclusion is that achievement is a function not of school size but of ruralness/urbanness.

Russo and Checketts (1978) studied the effects of class and school size on ACT scores. Controlling for academic course taking, educational aspirations, class size, absenteeism, and birth order and number of siblings, they found that students from small high schools scored higher on the ACT, although class size and school size "do not seem to influence achievement test scores to any large extent." The strongest predictors of ACT scores were courses taken and college plans.

Anderson et al. (1958) measured the effects of school size on the achievement of students in the top 10% and in the bottom 10% of their high schools. They divided schools into six size categories, from "less than 50" students to "greater than 600." They did not control for any factors other than size. Most notably, they did not control for parents' education, academic courses taken, class size, or elementary school factors. The areas studied were math, science, social science, English, and IQ. Comparisons were made by combining all the scores and finding the overall top and bottom 10% in each area. If a particular school made up .5% of the total study, then the top 10% from that school should make up .5% of the overall top 10% in each area. If the school is over- (or under-) represented, then they do better (or worse) than average.

They found that for IQ and social studies, the smaller schools - those with less than 300 students - were vastly over-represented in the bottom 10%. The very smallest schools - those with less than 100 students - were slightly underrepresented in the top 10% in math. There were no other consistent patterns. From this study it may appear that the achivement of the very best students is little affected by school size, but the worst students can suffer

somewhat from small schools. Except that the absence of any controls makes such conclusions questionable.

Flanagan's Project Talent (1962) was conducted on a grand scale, aiming to discover the factors that conduce to excellence in schooling. Numerous community, curriculum, and other school factors were investigated. No correlation between high school size and subject matter test scores or reading ability were found. However, Kiesling (1979) used Flanagan's data, and determined that large schools were less efficient.

A committee established by the State of Minnesota to measure the effects of size found (MPSSC, 1969) that students in large high schools scored higher on the Minnesota SAT. They grouped schools in five groups, from "less than 225" to "greater than 2,026." But they too did not control for parents' education, class size, or ruralness.

Attitudes

The attitudinal and affective characteristics looked at by many researchers are of varied importance. Consider, for example, "Dependence on adults." How would one measure such a thing? Dependence on adults for what? Why is it supposed to be good, or bad? Depending on the circumstances, such dependence can be wise or unwise, courageous or not. Or consider "Difficulty in learning." Do students who have difficulty learning learn less? If so, do they learn less of anything important? More importantly, why would anyone think that size of school per se could possibly affect ease of learning?

The point is that the legitimate purpose of school, its raison d'etre, is to prepare children to be able to lead "useful, happy, productive lives" outside of school. Whether they would prefer to be in a large or small class, whether they like their teachers or have any number of other positive attitudes about the school environment, are hardly important compared to whether they receive a quality education. It would be naive to suppose that the child's interest in school (or lack thereof) does not make a difference towards educationally relevant outcomes. But the likelihood that a child's interest in school is an artifact of their learning, rather than a cause of it, has been overlooked by many school researchers.

On the other hand, if acquired attitudes to school carry over into later years, then students who do not like school may avoid careers for which substantial training programs are required. However, the only relevant study we were able to uncover showed results incompatible with this hypothesis. Harmon (1961) examined the backgrounds of all Ph.D. recipients in the country for one year, and sorted their high schools into nine size categories, from "less than 80" to "greater than 3,200." Depending on the field, small school students consistently were from 2 to 10 times less likely to receive Ph.D.s as students from larger schools. In total, students from the largest schools were 6 1/2 times as likely as students from the smallest schools to earn the Ph.D. This does not disprove the hypothesis about attitudes and learning, but it does suggest that other factors may be more important for motivating higher learning.

Other studies have been done concerning the relationship between school size and attitudinal outcomes of some interest. Two studies we found relate small schools to alienation. Alienation would be an outcome of interest if alienated youngsters or the adults they become are, for example, less happy; have less self-esteem; have less motivation to succeed in activities, in school, or in careers; care less about other people; or engage in destructive activities and crimes, (see Panel on Youth 1974).

Grabe (1981) compared scores on the Kunkel, Thompson, and McElhinney Alienation Scale and found that small school (less than 720) students are slightly more alienated. But we are not told what they are alienated from. And since he does not control for family, community, or school factors, we do not know whether the differences are attributable to school size, or even to school at all.

Grabe & Latta (1977) also found that smallness correlates with alienation. This study used only two size groups: small schools are those with less than 580 students, large schools are those with more than 580. They also found that smallness has a negative relation to pressure for intellectual orientation. (Is this because they are less intellectually oriented, or because there is less need for pressure?) They found as well that the degree of alienation varies more widely in small schools.

Lindsay (1982) found that students in small schools identify more with the statements "I feel part of my school" and "I have been satisfied with my required courses." This may have some connection to alienation, in which case it would suggest the opposite of what Grabe (1976) and Grabe & Latta (1977) found. Or it may suggest something about educational quality, although it is ambiguous in this regard: if students in small schools are more satisfied with their required courses, is this because the courses are good, or because the teachers are less demanding, or because even though the courses are poor, the students are not able to recognize this?

Cullers (1973) found that a majority of students in small high schools tended to be dissatisfied with (a) interpersonal relations with staff, (b) academic pressure, (c) rules and regulations, and (d) activities and resources. Students in the medium schools were dissatisfied with academic pressure, but not with the other categories. And students in the large schools did not express dissatisfaction in any category. He took small schools to be those with less than 800 students, which again is quite large for a rural school, and which probably forces him to miss information that would be important for our purposes. (Large schools were those with more than 2,000; and medium those with 800-2,000.)

Campbell et al. (1981) took matched pairs of elementary students, controlling for SES of parents, SES of the community, age, sex, and IQ. All the subjects in these pairs had been at the same school for at least five years. A small elementary school was one with less than 450 students; medium schools had 450-700 students. They found the effects of size to be insignificant: "When more or better resources are dependent on increases in

enrollment, they are more than discounted by lower involvement on the part of the pupils."

Smallness was shown to be positively related to "concern for persons," but it is not made clear whether this concern is general and signifies an ethical sense, or whether it applies only to selected individuals in school. Smallness was also positively related to some factors which we have claimed are not of interest, for example "attitude towards school," but the effect was too small to be of any "practical educational significance" anyway.

Edington and Gardner (1984) used results from a State-wide testing of Montana high school students, and found that students in small schools score higher on measures of (i) goal setting, (ii) persistence, (iii) self-concept, and (iv) career awareness and planning. They did not control for any home or school factors.

One might suppose that students who enjoy school more would have less absences. Lindsay (1982) found that small high schools have higher attendance, controlling for SES and ruralness. Small schools were those with less than 400 students, medium schools had 400-1600 students. Rutter (1979) found that size had no effect on attendance, behavior, or delinquency. However, Rutter studied only schools in London, England, where there are no very small or rural schools. If school is of value, than one would suppose that a higher degree of attendance would be beneficial; but the learning differentials may be quite small, even nonquantifiable.

Lasting Effects

Lindsay (1984) used data from the National Longitudinal Survey to find out which high school factors correlated with participation in adult life. He looked at SES, sex, academic ability, sociability, educational attainment, community size, and high school size, participation, curriculum "track," and class rank. He found that high school participation is a significant predictor of voluntary social activity as a young adult, although it is not nearly as strong a predictor as class rank or educational attainment. School size is a weaker predictor, but only because it correlates with participation: it disappears as a predictor when participation is held constant.

Baird's study (1969) also showed that college students who attended small schools were less likely to have accomplishments in art and writing; also, small school men achieve less in drama, while small school women are less often leaders. But small school women more likely to be recognized for excellence, winning awards or scholarships, than large school women.

In both Dickenson's (1958) and Hoyt's (1959) studies, no difference in college achievement was attributable to size of high school. Dickenson did find that small school graduates had a higher college dropout rate, but there was no difference when mental ability was held constant. He did not rule out the possibility that differentials in mental ability could be attributable to school size, but given our other findings it seems more likely that they would be due to a characteristically lower SES for small schools.

CONCLUSIONS

It is clear that economies of scale are available in schooling. It is also clear that there exist diseconomies. What is not clear is the point at which the diseconomies surpass the economies. This is because there is a multitude of factors determining this point, each of which raises serious problems of measurement and interpretation. Thus, the economics literature on economies of scale in schooling yields contradictory results. However, some conclusions can be drawn.

One primary factor in schooling costs would appear to be population density, and concomitant transportation costs. Instructional costs per se decrease with increasing size, up to a certain point; but it can be quite expensive to increase (by busing) the number of students, which is necessary to take advantage of size economies. Population density and transportation costs set limits on how many schools and districts are economically feasible for a given locality.

Take as an example three studies that were commissioned by State and Provincial educational authorities to determine the advisability of various incentive programs for school district reorganization. St. Louis & McNamara (1970) studied Oregon school systems; BCSTA (1971)studied British Columbia school systems; and MAST (1971) studied Manitoba school systems. All are from the same year (1970 data). Each measured size of district as number of pupils in grades K-12, and costs as expenditures per pupil. None measured quality, so any comparisons between them must be circumspect. Each found economies and diseconomies of size. Yet the differences are what are noteworthy.

In Oregon, the optimal district size was about 51,000 students. In British Columbia, the optimal size was 15-20,000 students, much less than half of what it is in Oregon. The population density in Oregon is about twice that of British Columbia. In Manitoba, the optimal size was about 4,000 students, or less than one-tenth of what it is in Oregon. The population density in Manitoba is about one-fourth that of Oregon. Notice that as population becomes sparser, the optimal size of school decreases at an increasing rate.

Of course, these studies did not account for quality, and nothing concrete can be concluded from them. But even without direct comparison, it seems clear that it cannot be less expensive to offer a quality program in a sparsely populated area. Big schools can easily be made into several small schools, but making small schools into big schools can involve considerable transportation costs.

In considering quality as a factor in economies of scale in schooling, the clearest feature is specialization of personnel, especially teachers. Expanded numbers of students allows for an expansion of the teaching staff without increasing per pupil costs. This can allow schools to offer more courses and teachers to be more specialized, both arguably improvements in quality. However, Monk (1986) presents evidence that ceilings exist on the degree to which teachers actually specialize, ceilings that are encountered at relatively low school enrollment levels.

Another important factor in school costs is class size and student-teacher ratio. Instructional expenses tend to be the largest portion of a school budget, and increasing class size is a simple way to decrease expenditures. What difference class size makes on learning is unclear. But it is clear that very small schools will find it very costly to offer a wide range of courses and will often find it necessary to use teachers outside their areas of expertise. There is to date no usable research on how small a school or district must be to face these problems acutely.

Contrarily, on the basis of the psychological evidence available, the quality argument for increasing school size appears unwarranted. Participation, leadership, and accomplishments are higher in small schools. These differences are directly attributable to size. It is not clear that these have any lasting effects, but there are so many influences on a person throughout their lives that it is hard to draw conclusions about the effects of childhood experiences with much confidence. On the whole, one would think that such high school activities would be beneficial, other things being equal.

Aspirations are lower for small school students, but this seems to be due to family and community factors. Horizon-widening is an educational function, and rural schools probably need to do a better job of it than they do currently.

Small school students may be more alienated, but the results are not clear. It is also not clear why small school students would be more alienated, whether it has to do with school size itself, or with family or community factors, or with school administrative style, or what. More needs to be done on this topic.

The worst small school students do worse in social studies than their big school counterparts. This is possibly due to the fact that smaller schools offer fewer social studies courses; along with foreign languages (which were not studied; NYED 1976) they are some of the first curricular offerings to be cut when enrollments are low. There are several ways to alleviate such problems, closing schools and granting categorical aid being just two.

Although we have said that, on the basis of the psychological evidence available, there are no grounds for thinking that increasing school size will improve school quality, the sparsity of adequate studies which measure outcomes of importance and which control for important independent factors does not adequately justify the conclusion that small schools are better, either. But the evidence supporting this claim is more weighted than the evidence supporting the contrary.

Thus we should be highly skeptical of recommendations regarding school and school district size and reorganization when they are based on broad claims about economies of scale and schools.

In closing, it is instructive to note that the education departments of two states have published reports avidly advocating the elimination of small schools. North Carolina's Superintendent's office recommended that all elementary schools with less than 500 pupils, all high schools with less than

1,000 pupils, and all school districts with less than 10,000 pupils be merged or expanded or otherwise phased out (Weaver 1986). The Illinois State Board of Education called school size "the strongest single [school] influence" on achievement differences in the State (ISBE, 1985), but made no specific recommendations. Clearly there is a discrepancy between the findings of the study at hand and those of North Carolina and Illinois.

This is readily explainable. The author(s) of the North Carolina report show no understanding of the serious school size literature. The size recommendations are based only on literature published before 1974. The most recent academic citation is of Fox's 1981 survey article, and Fox's discussion is abused (Weaver, 1981, p. 21). One of Fox's central points was that the economies of size literature had not paid sufficient attention to measuring quality of school outcomes, and that because of this gap no solid conclusions can be drawn. Yet the North Carolina report glides over this wide gap in its discussion of these studies, and continues to ignore the quality question. It is also curious that the post-1974 articles cited by Fox (1981) are not referred to at all.

Similarly, the Illinois report (ISBE 1985) has not benefitted from the collective wisdom gained through years of studying the effects of school and district size. Rather than cite these studies, Illinois conducted an empirical study of its own. It is a poorly conducted and reported study. The report makes much of its method of analyzing the effect of the school variables twice, both individually and all at once; but this signifies little since they never all at once consider the effects of school and student and community factors. Even with this manipulation, the percentage of variance on the various test scores explained by school size (R^2) appears to be at the most 4 or 5%.[5] That estimate assumes that their results are statistically significant, although no such claim is made. What is most surprising (and suspicious) is that the clearly recognized predictors of academic performance - parent's SES, IQ, courses taken.

The commitment to increasing school district size runs deep in these states, and we suspect elsewhere as well. In light of this, it is all the more important that the ambiguous nature of the research on district size reviewed in this paper become more widely understood and appreciated.

NOTES

1.The State of New York has been commendably assiduous in making such data available via the Comprehensive Assessment Report (CAR). This is a recent and unique effort.

2.Schools and teachers have not been held legally resposible when students do not learn, not even when they are given (or subjected to) inadequate or bad teachers and curricula. Donahue v. Copiague Union Free School District. 47 N.Y.2d. 440, 418 N.Y.S.2d 375 (Court of Appeals of New York, 1979); Peter W. v. San Franciso U. S. D. 60 Cal.App.3d. 814 (Court of Appeals of California, 1976).

3.For a knowledgeable source on this topic see Schoggen & Schoggen, 1984.

4.On the other hand, the student mix in a small rural school may be more likely to be highly varied than would the student mix in an inner city or suburban school.

5. It is really impossible to tell for any of the regression equations what R^2 equals. While the author(s) report the percentage of variance explained for each equation as a whole, they do not list it separately for the several factors. Instead, they write "++", "+", "-", and " ", without indicating the coefficient, standard error, level of significance, variance explained, or any of the other standard and relevant statistical information.

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